

IN THE CLAIMS:

Kindly amend the claims as follows:

1. (Currently amended) A method of producing a modified chitosan polymer or oligomer, ~~which comprises~~ comprising:

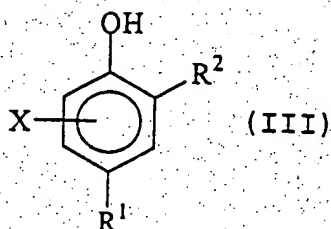
reacting an enzyme with at least one phenolic compound in the presence of a chitosan polymer or oligomer, wherein the reaction is carried out in a homogenous phase solution, and producing an insolubilized modified chitosan polymer or oligomer; and solubilizing the modified chitosan polymer or oligomer.

2. (Original) The method of claim 1, wherein the enzyme is an enzyme that uses molecular oxygen as an oxidizing agent to oxidize phenolic compounds.

3. (Original) The method of claim 2, wherein the enzyme is a tyrosinase, a phenol oxidase, a polyphenol oxidase, or a mixture thereof.

4. (Currently amended) The method of claim 1, wherein the at least one phenolic compound is phenol, a substituted phenol, a polymer having at least one phenolic moiety or tyrosine ~~reside~~ residue, or a protein having at least one phenolic moiety or tyrosine residue.

5. (Original) The method of claim 4, wherein the at least one phenolic compound is a compound having the formula



wherein R^1 is hydrogen, hydroxyl, alkyl or substituted alkyl, alkenyl or substituted alkenyl, cycloalkyl or substituted cycloalkyl, cycloalkenyl or substituted cycloalkenyl, aryl or substituted aryl, amino or substituted amino, carboxylic acid or carboxylic acid ester, or an aldehyde or ketone group;

R^2 is H or OH; and

X is one or more additional substituents that can be halogen, hydroxy, alkyl or substituted alkyl, alkenyl or substituted alkenyl, cycloalkyl or substituted cycloalkyl, cycloalkenyl or substituted cycloalkenyl, aryl or substituted aryl, amino or substituted amino, carboxylic acid or carboxylic acid ester, or two adjacent substituents which are joined to form a ring.

6. (Original) The method of claim 1, wherein the at least one phenolic compound is selected from the group consisting of phenol, 2-chlorophenol, 2,2'-dihydroxybiphenyl, 8-hydroxyquinoline, 3-amino-phenol, o-cresol, m-cresol, p-cresol, 2,3-dimethylphenol, 2-methoxyphenol, resorcinol, 1-nitrosonaphthol, hydroquinone, 4-chlorophenol, 4,4'-dihydroxybiphenyl, 2-aminophenol, 3-methoxyphenol, 1-naphthol, 4-phenylphenol, p-hydroxyphenoxyacetic acid, 5-methylresorcinol, tert-butylcatechol,

catechol, methylcatechol, tyramine, dopamine, caffeic acid, hydroxycinnamic acid and chlorogenic acid.

7. (Original) The method of claim 6, wherein the at least one phenolic compound is chlorogenic acid, caffeic acid, p- cresol, catechol, dopamine or a mixture thereof.

8. (Original) The method of claim 1 wherein the at least one phenolic compound is a mixture of phenolic compounds.

9. (Original) The method of claim 1, wherein the solution is an aqueous solution or an aqueous alcohol solution.

10. (Original) The method of claim 9, wherein the solution has a pH of less than about 6.5.

11. (Original) The method of claim 9, wherein the solution has a pH of at least about 8.

12. (Original) The method of claim 1 wherein the modified chitosan polymer or oligomer is soluble in aqueous alkaline solution.

13. (Original) The method of claim 12, wherein the solution is an aqueous solution or an aqueous alcohol solution.

14. (Original) The method of claim 12, wherein the reaction is carried out at a pH of about 5.5 to about 6.5.

15. (Original) The method of claim 12, wherein the modified chitosan polymer or oligomer is soluble in aqueous alkaline solutions having a pH of at least about 8.

16. (Original) The method of claim 15, wherein the modified chitosan polymer or oligomer is soluble in aqueous alkaline solutions having a pH of about 8 to about 14.

17. (Original) The method of claim 12, wherein the modified chitosan polymer or oligomer is soluble in aqueous acidic solutions.

18. (Original) The method of claim 12, wherein the modified chitosan polymer or oligomer is insoluble in aqueous solutions having a neutral pH.

19. (Original) The method of claim 10, wherein the modified chitosan polymer or oligomer is soluble in aqueous alkaline solutions having a pH of at least about 8, soluble in aqueous acidic solutions, and insoluble in aqueous solutions having a neutral pH.

20. (Original) The method of claim 1 wherein the modified chitosan polymer or oligomer has a high viscosity in solution.

21. (Original) The method of claim 20, wherein the viscosity of a solution of the modified chitosan polymer or oligomer is at least about 1 poise.

22. (Original) The method of claim 21, wherein the viscosity of a solution of the modified chitosan polymer is at least about 40 poise.

23. (Original) The method of claim 22, wherein the viscosity of a solution of the modified chitosan polymer or oligomer is at least about 400 poise.

24. (Original) A method of producing a modified chitosan polymer, which comprises:

(a) providing a chitosan polymer or oligomer solubilized in a solution;

(b) reacting an enzyme with at least one phenolic compound in the presence of the chitosan polymer or oligomer to produce a modified chitosan polymer or oligomer; and

(c) further reacting an enzyme with at least one phenolic compound in the presence of the modified chitosan polymer or oligomer to produce a further modified chitosan polymer or oligomer.

25. (Original) The method of claim 24, which further comprises repeating step (c) to further modify the modified chitosan polymer.

26. (Original) The method of claim 24, wherein the reaction of step (b) is carried out at a pH of about 5.5 to about 6.5.

27. (Original) The method of claim 24, wherein the reaction of step (c) is carried out at a pH greater than about 6.5.

28. (Original) The method of claim 27, wherein the reaction of step (c) is carried out at a pH of at least about 8.

Claims 29-34 (Cancelled)

35. (New) The method of claim 1, further comprising further reacting the modified chitosan polymer or oligomer.

36. (New) The method of claim 35, wherein said further reacting is performed in an alkaline solution.

37. (New) The method of claim 35, wherein said further reacting comprises reacting an enzyme with at least one phenolic compound in the presence of the modified chitosan polymer or oligomer to produce a further modified chitosan polymer or oligomer.

38. (New) The method of claim 35, wherein said further reacting comprises reacting an attached moiety of the modified chitosan polymer or oligomer, the attached moiety being derived from at least one of the enzyme and the phenolic compound.

39. (New) The method of claim 1, wherein said reacting comprises leaving an unmodified portion of the chitosan polymer or oligomer unreacted, and wherein the method further comprises separating the unmodified portion and the modified chitosan polymer or oligomer from one another.

40. (New) The method of claim 1, wherein the phenolic compound is selected from the group consisting of a phenolic protein and a phenolic peptide.

41. (New) The method of claim 24, wherein the at least one phenolic compound reacted in step (b) is different from the at least one phenolic compound further reacted in step (c).

42. (New) The method of claim 24, wherein said reacting step (b) comprises leaving an unmodified portion of the chitosan polymer or oligomer unreacted, and wherein the method further comprises separating the unmodified portion and the modified chitosan polymer or oligomer from one another prior to said further reacting step (c).

43. (New) A method of producing a modified chitosan polymer or oligomer, which comprises reacting an enzyme with at least one phenolic compound selected from the group consisting of a phenolic protein and a phenolic peptide in the presence of a chitosan polymer or oligomer, wherein the reaction is carried out in a homogenous phase solution.

44. (New) A method of producing a modified chitosan polymer or oligomer, comprising:
dissolving a chitosan polymer or oligomer in solution at a first acidic pH;
raising the pH of solution to a second acidic pH less than about 6.5; and
reacting an enzyme with at least one phenolic compound in the presence of the chitosan polymer or oligomer, wherein the reaction is carried out in a homogenous phase solution.

45. (New) The method of claim 44, wherein the first acidic pH is about 2-3.

46. (New) The method of claim 44, wherein the solution is aqueous.